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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/798,855

03/12/2004

Hisashi Amaya

12054-0024

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22902

7590

03/14/2007

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WASHINGTON, DC 20005

EXAMINER

ROE, JESSEE RANDALL

ART UNIT

PAPER NUMBER

1742

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

03/14/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

8

Office Action Summary	Application No. 10/798,855	Applicant(s) AMAYA ET AL.	
	Examiner Jessee Roe	Art Unit 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 13-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 13-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION***Status of Claims***

Claims 1-8 and 13-20 remain for examination wherein claims 3-8 are amended, claims 13-20 are new, and claims 9-12 are canceled.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lena (US 2,799,602).

Claims 1-2 are rejected on the same grounds as stated in the Office Action of 13 July 2006.

Claims 3-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshihiro et al. (JP 2001-152295) with evidence from the ASM Handbook Volume 4.

In regards to claims 3-4, Yoshihiro et al. (JP '295) disclose a martensitic stainless steel alloy (abstract and claims 1-5) as shown in the following table.

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (mass percent)	Overlapping range
(abstract and claims 1-5)			
C	0.01-0.10	0-0.012	0.01-0.012
Si	0.05-1.0	0-1.0	0.05-1.0
Mn	0.05-1.5	0-1	0.05-1
P	0-0.03	0-0.08	0-0.03

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Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (mass percent)	Overlapping range
S	0-0.01	0-0.01	0-0.01
Cr	9-15	10-15	10-15
Ni	0.1-4.5	0.1-0.6	0.1-0.6
Al	0-0.05	about 0.01 (Table 2)	about 0.01
N	0-0.1	0-0.02	0-0.02
Cu	0.05-5	0.1-0.6	0.1-0.6
Mo	0.05-5	0.1-0.6	0.1-0.6
Ti	0.005-0.5	0.005-0.05	0.005-0.05
V	0.005-0.5	0.01-0.1	0.01-0.1
Nb	0.005-0.5	0.01-0.1	0.01-0.1
Fe	balance	balance	balance

The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, titanium, vanadium, and niobium of the martensitic stainless steel alloy disclosed by Yoshihiro et al. (JP '295) overlaps with the composition of the claimed invention.

Therefore, a prima facie case of obviousness exists. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed composition over the disclosed composition of Yoshihiro et al. (JP '295) because Yoshihiro et al. (JP '295) teaches the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

In regards to the claimed formulas of $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 3) and $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 4), the Examiner asserts that the martensitic stainless steel of Yoshihiro et al. (JP '295) clearly envision compositions satisfying this formula because Yoshihiro et al. (JP '295) clearly envision compositions having molybdenum compositions from 0.1 to 0.6 mass percent and copper compositions from 0.1 to 0.6 mass percent.

In regards to the claim limitation of having hardness that is 30-45 HRC, Yoshihiro et al. (JP '295) disclose that the carbon and nitrogen content would be result-effective variables in achieving a desired hardness [0012 and 0014]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the carbon and nitrogen contents to achieve a desired hardness. See MPEP 2144.05 II.

In regards to the claim limitation of having not more than 0.5 volume percent carbides in the grain boundaries, Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would have carbides in the grain boundaries of the prior austenite in a proportion of not more than 0.5 volume percent.

The ASM Handbook Volume 4 discloses that high carbide formation results from high temperature tempering (pg. 124, cols. 1-2). Yoshihiro et al. (JP '295) do not specify a tempering treatment and especially do not specify a high temperature tempering treatment. Also, Yoshihiro et al. (JP '295) disclose a low (0-0.012 mass percent) but overlapping carbon content, a low (0.1-0.6 mass percent) but overlapping molybdenum content (which would be a strong carbide former) and a substantially similar treatment process. For all of the above reasons, it would be expected that the martensitic stainless steel of Yoshihiro et al. (JP '295) would not have carbides in the grain boundaries of the prior austenite in a proportion of more than 0.5 volume percent. See MPEP 2112.01 I.

In regards to claims 5-6, Yoshihiro et al. (JP '295) disclose a martensitic stainless steel alloy (abstract and claims 1-5) as shown in the table on the following page.

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (mass percent)	Overlapping range
(abstract and claims 1-5)			
C	0.01-0.10	0-0.012	0.01-0.012
Si	0.05-1.0	0-1.0	0.05-1.0
Mn	0.05-1.5	0-1	0.05-1
P	0-0.03	0-0.08	0-0.03
S	0-0.01	0-0.01	0-0.01
Cr	9-15	10-15	10-15
Ni	0.1-4.5	0.1-0.6	0.1-0.6
Al	0-0.05	about 0.01 (Table 2)	about 0.01
N	0-0.1	0-0.02	0-0.02
Cu	0.05-5	0.1-0.6	0.1-0.6
Mo	0.05-5	0.1-0.6	0.1-0.6
B	0.0002-0.005	0.0005-0.005	0.0005-0.005
Fe	balance	balance	balance

The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, and boron of the martensitic stainless steel alloy disclosed by Yoshihiro et al. (JP '295) overlap with the composition of the claimed invention. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed composition over the disclosed composition of Yoshihiro et al. (JP '295) because Yoshihiro et al. (JP '295) teaches the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

In regards to the claimed formulas of $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 5) and $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 6), the Examiner asserts that the martensitic stainless steel of Yoshihiro et al. (JP '295) clearly envision compositions satisfying this formula because Yoshihiro et al. (JP '295) clearly envision compositions having molybdenum

compositions from 0.1 to 0.6 mass percent and copper compositions from 0.1 to 0.6 mass percent.

In regards to the claim limitation of having hardness that is 30-45 HRC, Yoshihiro et al. (JP '295) disclose that the carbon and nitrogen content would be result-effective variables in achieving a desired hardness [0012 and 0014]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the carbon and nitrogen contents to achieve a desired hardness. See MPEP 2144.05 II.

In regards to the claim limitation of having not more than 0.5 volume percent carbides in the grain boundaries. Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would have carbides in the grain boundaries of the prior austenite in a proportion of not more than 0.5 volume percent.

The ASM Handbook Volume 4 discloses that high carbide formation results from high temperature tempering (pg. 124, cols. 1-2). Yoshihiro et al. (JP '295) do not specify a tempering treatment and especially do not specify a high temperature tempering treatment. Also, Yoshihiro et al. (JP '295) disclose a low (0-0.012 mass percent) but overlapping carbon content, a low (0.1-0.6 mass percent) but overlapping molybdenum content (which would be a strong carbide former) and a substantially similar treatment process. For all of the above reasons, it would be expected that the martensitic stainless steel of Yoshihiro et al. (JP '295) would not have carbides in the grain boundaries of the prior austenite in a proportion of more than 0.5 volume percent. See MPEP 2112.01 I.

In regards to claims 7-8, Yoshihiro et al. (JP '295) disclose a martensitic stainless steel alloy (abstract and claims 1-5) as shown in the table on the following page.

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (mass percent)	Overlapping range
(abstract and claims 1-5)			
C	0.01-0.10	0-0.012	0.01-0.012
Si	0.05-1.0	0-1.0	0.05-1.0
Mn	0.05-1.5	0-1	0.05-1
P	0-0.03	0-0.08	0-0.03
S	0-0.01	0-0.01	0-0.01
Cr	9-15	10-15	10-15
Ni	0.1-4.5	0.1-0.6	0.1-0.6
Al	0-0.05	about 0.01 (Table 2)	about 0.01
N	0-0.1	0-0.02	0-0.02
Cu	0.05-5	0.1-0.6	0.1-0.6
Mo	0.05-5	0.1-0.6	0.1-0.6
Ti	0.005-0.5	0.005-0.05	0.005-0.05
B	0.0002-0.005	0.0005-0.005	0.0005-0.005
V	0.005-0.5	0.01-0.1	0.01-0.1
Nb	0.005-0.5	0.01-0.1	0.01-0.1
Fe	balance	balance	balance

The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, titanium, vanadium, boron and niobium of the martensitic stainless steel alloy disclosed by Yoshihiro et al. (JP '295) overlap with the composition of the claimed invention. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed composition over the disclosed composition of Yoshihiro et al. (JP '295) because Yoshihiro et al. (JP '295) teaches the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

In regards to the claimed formulas of $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 7) and

$0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 8), the Examiner asserts that the martensitic stainless steel of Yoshihiro et al. (JP '295) clearly envision compositions satisfying this formula because Yoshihiro et al. (JP '295) clearly envision compositions having molybdenum compositions from 0.1 to 0.6 mass percent and copper compositions from 0.1 to 0.6 mass percent.

In regards to the claim limitation of having hardness that is 30-45 HRC, Yoshihiro et al. (JP '295) disclose that the carbon and nitrogen content would be result-effective variables in achieving a desired hardness [0012 and 0014]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the carbon and nitrogen contents to achieve a desired hardness. See MPEP 2144.05 II.

In regards to the claim limitation of having not more than 0.5 volume percent carbides in the grain boundaries, Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would have carbides in the grain boundaries of the prior austenite in a proportion of not more than 0.5 volume percent.

The ASM Handbook Volume 4 discloses that high carbide formation results from high temperature tempering (pg. 124, cols. 1-2). Yoshihiro et al. (JP '295) do not specify a tempering treatment and especially do not specify a high temperature tempering treatment. Also, Yoshihiro et al. (JP '295) disclose a low (0-0.012 mass percent) but overlapping carbon content, a low (0.1-0.6 mass percent) but overlapping molybdenum content (which would be a strong carbide former) and a substantially similar treatment process. For all of the above reasons, it would be expected that the martensitic stainless steel of Yoshihiro et al. (JP '295) would not have carbides in the grain

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boundaries of the prior austenite in a proportion of more than 0.5 volume percent.

See MPEP 2112.01 I.

Claims 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshihiro et al. (JP 2001-152295) with evidence from the ASM Handbook Volume 4 and Kushida et al. (US 6,379,821).

In regards to claims 13-14, Yoshihiro et al. (JP '295) disclose a martensitic stainless steel alloy (abstract and claims 1-5) as shown in the table below.

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (mass percent)	Overlapping range
(abstract and claims 1-5)			
C	0.01-0.10	0-0.012	0.01-0.012
Si	0.05-1.0	0-1.0	0.05-1.0
Mn	0.05-1.5	0-1	0.05-1
P	0-0.03	0-0.08	0-0.03
S	0-0.01	0-0.01	0-0.01
Cr	9-15	10-15	10-15
Ni	0.1-4.5	0.1-0.6	0.1-0.6
Al	0-0.05	about 0.01 (Table 2)	about 0.01
N	0-0.1	0-0.02	0-0.02
Cu	0.05-5	0.1-0.6	0.1-0.6
Mo	0.05-5	0.1-0.6	0.1-0.6
Fe	balance	balance	balance

The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, and molybdenum of the martensitic stainless steel alloy disclosed by Yoshihiro et al. (JP '295) overlap with the composition of the claimed invention. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed

composition over the disclosed composition of Yoshihiro et al. (JP '295) because Yoshihiro et al. (JP '295) teaches the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

In regards to the claimed formulas of $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 13) and $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 14), the Examiner asserts that the martensitic stainless steel of Yoshihiro et al. (JP '295) clearly envision compositions satisfying this formula because Yoshihiro et al. (JP '295) clearly envision compositions having molybdenum compositions from 0.1 to 0.6 mass percent and copper compositions from 0.1 to 0.6 mass percent.

In regards to the claim limitation of having hardness that is 30-45 HRC, Yoshihiro et al. (JP '295) disclose that the carbon and nitrogen content would be result-effective variables in achieving a desired hardness [0012 and 0014]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the carbon and nitrogen contents to achieve a desired hardness. See MPEP 2144.05 II.

In regards to the claim limitation of having not more than 0.5 volume percent carbides in the grain boundaries. Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would have carbides in the grain boundaries of the prior austenite in a proportion of not more than 0.5 volume percent.

The ASM Handbook Volume 4 discloses that high carbide formation results from high temperature tempering (pg. 124, cols. 1-2). Yoshihiro et al. (JP '295) do not specify a tempering treatment and especially do not specify a high temperature tempering treatment. Also, Yoshihiro et al. (JP '295) disclose a low (0-0.012 mass percent) but

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overlapping carbon content, a low (0.1-0.6 mass percent) but overlapping molybdenum content (which would be a strong carbide former) and a substantially similar treatment process. For all of the above reasons, it would be expected that the martensitic stainless steel of Yoshihiro et al. (JP '295) would not have carbides in the grain boundaries of the prior austenite in a proportion of more than 0.5 volume percent. See MPEP 2112.01 I.

Still regarding claims 13-14, Yoshihiro et al. (JP '295) disclose that the martensitic stainless steel would be fabricated by cooling at 50°C/hour or less. However, Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would be fabricated in a vacuum atmosphere. Therefore, it would be expected that the a non-forced air cooling atmosphere used for the preparation of the martensitic stainless steel would be within the scope of Yoshihiro et al. (JP '295).

Still regarding claims 13-14, Yoshihiro et al. (JP '295) do not specify wherein the amount of copper and molybdenum present would be an amount effective to form a sulfide layer on a formed chromium oxide layer.

Kushida et al. ('821) disclose a substantially similar martensitic stainless steel (col. 5, see weld metal) requiring at least 0.5 mass percent of each of molybdenum and copper to provide sour gas resistance when being exposed to a hydrogen sulfide containing fluid (col. 10, lines 38-63). This resistance (layer) would inherently be formed at the surface of the martensitic stainless steel because the surface would be the main point of contact with the fluid.

Yoshihiro et al. (JP '295) disclose a martensitic stainless steel wherein the

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copper and molybdenum content would be 0.1-0.6 mass percent (overlapping the requirement of Kushida et al. ('821) at 0.5-0.6 mass percent). Therefore, it would be obvious to one of ordinary skill that the martensitic stainless steel of Yoshihiro et al. (JP '295) would have the effective amounts of copper and molybdenum to form a sulfide layer on a formed chromium oxide layer as a result of exposure to a sulfur containing environment.

In regards to claims 15-16, Yoshihiro et al. (JP '295) disclose a martensitic stainless steel alloy (abstract and claims 1-5) as shown in the table on the following page.

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (mass percent)	Overlapping range
(abstract and claims 1-5)			
C	0.01-0.10	0-0.012	0.01-0.012
Si	0.05-1.0	0-1.0	0.05-1.0
Mn	0.05-1.5	0-1	0.05-1
P	0-0.03	0-0.08	0-0.03
S	0-0.01	0-0.01	0-0.01
Cr	9-15	10-15	10-15
Ni	0.1-4.5	0.1-0.6	0.1-0.6
Al	0-0.05	about 0.01 (Table 2)	about 0.01
N	0-0.1	0-0.02	0-0.02
Cu	0.05-5	0.1-0.6	0.1-0.6
Mo	0.05-5	0.1-0.6	0.1-0.6
Ti	0.005-0.5	0.005-0.05	0.005-0.05
V	0.005-0.5	0.01-0.1	0.01-0.1
Nb	0.005-0.5	0.01-0.1	0.01-0.1
Fe	balance	balance	balance

The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, titanium, vanadium and niobium of the martensitic stainless steel alloy disclosed by

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Yoshihiro et al. (JP '295) overlap with the composition of the claimed invention.

Therefore, a prima facie case of obviousness exists. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed composition over the disclosed composition of Yoshihiro et al. (JP '295) because Yoshihiro et al. (JP '295) teaches the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

In regards to the claimed formulas of $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 15) and $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 16), the Examiner asserts that the martensitic stainless steel of Yoshihiro et al. (JP '295) clearly envision compositions satisfying this formula because Yoshihiro et al. (JP '295) clearly envision compositions having molybdenum compositions from 0.1 to 0.6 mass percent and copper compositions from 0.1 to 0.6 mass percent.

In regards to the claim limitation of having hardness that is 30-45 HRC, Yoshihiro et al. (JP '295) disclose that the carbon and nitrogen content would be result-effective variables in achieving a desired hardness [0012 and 0014]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the carbon and nitrogen contents to achieve a desired hardness. See MPEP 2144.05 II.

In regards to the claim limitation of having not more than 0.5 volume percent carbides in the grain boundaries. Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would have carbides in the grain boundaries of the prior austenite in a proportion of not more than 0.5 volume percent.

The ASM Handbook Volume 4 discloses that high carbide formation results from

high temperature tempering (pg. 124, cols. 1-2). Yoshihiro et al. (JP '295) do not specify a tempering treatment and especially do not specify a high temperature tempering treatment. Also, Yoshihiro et al. (JP '295) disclose a low (0-0.012 mass percent) but overlapping carbon content, a low (0.1-0.6 mass percent) but overlapping molybdenum content (which would be a strong carbide former) and a substantially similar treatment process. For all of the above reasons, it would be expected that the martensitic stainless steel of Yoshihiro et al. (JP '295) would not have carbides in the grain boundaries of the prior austenite in a proportion of more than 0.5 volume percent. See MPEP 2112.01 I.

Still regarding claims 15-16, Yoshihiro et al. (JP '295) disclose that the martensitic stainless steel would be fabricated by cooling at 50°C/hour or less. However, Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would be fabricated in a vacuum atmosphere. Therefore, it would be expected that the a non-forced air cooling atmosphere used for the preparation of the martensitic stainless steel would be within the scope of Yoshihiro et al. (JP '295).

Still regarding claims 15-16, Yoshihiro et al. (JP '295) do not specify wherein the amount of copper and molybdenum present would be an amount effective to form a sulfide layer on a formed chromium oxide layer.

Kushida et al. ('821) disclose a substantially similar martensitic stainless steel (col. 5, see weld metal) requiring at least 0.5 mass percent of each of molybdenum and copper to provide sour gas resistance when being exposed to a hydrogen sulfide

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containing fluid (col. 10, lines 38-63). This resistance (layer) would inherently be formed at the surface of the martensitic stainless steel because the surface would be the main point of contact with the fluid.

Yoshihiro et al. (JP '295) disclose a martensitic stainless steel wherein the copper and molybdenum content would be 0.1-0.6 mass percent (overlapping the requirement of Kushida et al. ('821) at 0.5-0.6 mass percent). Therefore, it would be obvious to one of ordinary skill that the martensitic stainless steel would have the effective amounts of copper and molybdenum to form a sulfide layer on a formed chromium oxide layer as a result of exposure to a sulfur containing environment.

In regards to claims 17-18, Yoshihiro et al. (JP '295) disclose a martensitic stainless steel alloy (abstract and claims 1-5) as shown below.

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (mass percent)	Overlapping range
(abstract and claims 1-5)			
C	0.01-0.10	0-0.012	0.01-0.012
Si	0.05-1.0	0-1.0	0.05-1.0
Mn	0.05-1.5	0-1	0.05-1
P	0-0.03	0-0.08	0-0.03
S	0-0.01	0-0.01	0-0.01
Cr	9-15	10-15	10-15
Ni	0.1-4.5	0.1-0.6	0.1-0.6
Al	0-0.05	about 0.01 (Table 2)	about 0.01
N	0-0.1	0-0.02	0-0.02
Cu	0.05-5	0.1-0.6	0.1-0.6
Mo	0.05-5	0.1-0.6	0.1-0.6
B	0.0002-0.005	0.0005-0.005	0.0005-0.005
Fe	balance	balance	balance

The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum,

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and boron of the martensitic stainless steel alloy disclosed by Yoshihiro et al. (JP '295) overlap with the composition of the claimed invention. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed composition over the disclosed composition of Yoshihiro et al. (JP '295) because Yoshihiro et al. (JP '295) teaches the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

In regards to the claimed formulas of $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 17) and $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 18), the Examiner asserts that the martensitic stainless steel of Yoshihiro et al. (JP '295) clearly envision compositions satisfying this formula because Yoshihiro et al. (JP '295) clearly envision compositions having molybdenum compositions from 0.1 to 0.6 mass percent and copper compositions from 0.1 to 0.6 mass percent.

In regards to the claim limitation of having hardness that is 30-45 HRC, Yoshihiro et al. (JP '295) disclose that the carbon and nitrogen content would be result-effective variables in achieving a desired hardness [0012 and 0014]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the carbon and nitrogen contents to achieve a desired hardness. See MPEP 2144.05 II.

In regards to the claim limitation of having not more than 0.5 volume percent carbides in the grain boundaries. Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would have carbides in the grain boundaries of the prior austenite in a proportion of not more than 0.5 volume percent.

The ASM Handbook Volume 4 discloses that high carbide formation results from high temperature tempering (pg. 124, cols. 1-2). Yoshihiro et al. (JP '295) do not specify a tempering treatment and especially do not specify a high temperature tempering treatment. Also, Yoshihiro et al. (JP '295) disclose a low (0-0.012 mass percent) but overlapping carbon content, a low (0.1-0.6 mass percent) but overlapping molybdenum content (which would be a strong carbide former) and a substantially similar treatment process. For all of the above reasons, it would be expected that the martensitic stainless steel of Yoshihiro et al. (JP '295) would not have carbides in the grain boundaries of the prior austenite in a proportion of more than 0.5 volume percent. See MPEP 2112.01 I.

Still regarding claims 17-18, Yoshihiro et al. (JP '295) disclose that the martensitic stainless steel would be fabricated by cooling at 50°C/hour or less. However, Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would be fabricated in a vacuum atmosphere. Therefore, it would be expected that the a non-forced air cooling atmosphere used for the preparation of the martensitic stainless steel would be within the scope of Yoshihiro et al. (JP '295).

Still regarding claims 17-18, Yoshihiro et al. (JP '295) do not specify wherein the amount of copper and molybdenum present would be an amount effective to form a sulfide layer on a formed chromium oxide layer.

Kushida et al. ('821) disclose a substantially similar martensitic stainless steel (col. 5, see weld metal) requiring at least 0.5 mass percent of each of molybdenum and copper to provide sour gas resistance when being exposed to a hydrogen sulfide

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containing fluid (col. 10, lines 38-63). This resistance (layer) would inherently be formed at the surface of the martensitic stainless steel because the surface would be the main point of contact with the fluid.

Yoshihiro et al. (JP '295) disclose a martensitic stainless steel wherein the copper and molybdenum content would be 0.1-0.6 mass percent (overlapping the requirement of Kushida et al. ('821) at 0.5-0.6 mass percent). Therefore, it would be obvious to one of ordinary skill that the martensitic stainless steel of Yoshihiro et al. (JP '295) would have the effective amounts of copper and molybdenum to form a sulfide layer on a formed chromium oxide layer as a result of exposure to a sulfur containing environment.

In regards to claims 19-20, Yoshihiro et al. (JP '295) disclose a martensitic stainless steel alloy (abstract and claims 1-5) as shown below.

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (mass percent)	Overlapping range
(abstract and claims 1-5)			
C	0.01-0.10	0-0.012	0.01-0.012
Si	0.05-1.0	0-1.0	0.05-1.0
Mn	0.05-1.5	0-1	0.05-1
P	0-0.03	0-0.08	0-0.03
S	0-0.01	0-0.01	0-0.01
Cr	9-15	10-15	10-15
Ni	0.1-4.5	0.1-0.6	0.1-0.6
Al	0-0.05	about 0.01 (Table 2)	about 0.01
N	0-0.1	0-0.02	0-0.02
Cu	0.05-5	0.1-0.6	0.1-0.6
Mo	0.05-5	0.1-0.6	0.1-0.6
Ti	0.005-0.5	0.005-0.05	0.005-0.05
B	0.0002-0.005	0.0005-0.005	0.0005-0.005
V	0.005-0.5	0.01-0.1	0.01-0.1
Nb	0.005-0.5	0.01-0.1	0.01-0.1
Fe	balance	balance	balance

The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, titanium, vanadium and niobium of the martensitic stainless steel alloy disclosed by Yoshihiro et al. (JP '295) overlap with the composition of the claimed invention. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed composition over the disclosed composition of Yoshihiro et al. (JP '295) because Yoshihiro et al. (JP '295) teaches the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

In regards to the claimed formulas of $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 19) and $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 20), the Examiner asserts that the martensitic stainless steel of Yoshihiro et al. (JP '295) clearly envision compositions satisfying this formula because Yoshihiro et al. (JP '295) clearly envision compositions having molybdenum compositions from 0.1 to 0.6 mass percent and copper compositions from 0.1 to 0.6 mass percent.

In regards to the claim limitation of having hardness that is 30-45 HRC, Yoshihiro et al. (JP '295) disclose that the carbon and nitrogen content would be result-effective variables in achieving a desired hardness [0012 and 0014]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the carbon and nitrogen contents to achieve a desired hardness. See MPEP 2144.05 II.

In regards to the claim limitation of having not more than 0.5 volume percent

carbides in the grain boundaries. Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would have carbides in the grain boundaries of the prior austenite in a proportion of not more than 0.5 volume percent.

The ASM Handbook Volume 4 discloses that high carbide formation results from high temperature tempering (pg. 124, cols. 1-2). Yoshihiro et al. (JP '295) do not specify a tempering treatment and especially do not specify a high temperature tempering treatment. Also, Yoshihiro et al. (JP '295) disclose a low (0-0.012 mass percent) but overlapping carbon content, a low (0.1-0.6 mass percent) but overlapping molybdenum content (which would be a strong carbide former and a substantially similar treatment process. For all of the above reasons, it would be expected that the martensitic stainless steel of Yoshihiro et al. (JP '295) would not have carbides in the grain boundaries of the prior austenite in a proportion of more than 0.5 volume percent. See MPEP 2112.01 I.

Still regarding claims 19-20, Yoshihiro et al. (JP '295) disclose that the martensitic stainless steel would be fabricated by cooling at 50°C/hour or less. However, Yoshihiro et al. (JP '295) do not specify wherein the martensitic stainless steel would be fabricated in a vacuum atmosphere. Therefore, it would be expected that the a non-forced air cooling atmosphere used for the preparation of the martensitic stainless steel would be within the scope of Yoshihiro et al. (JP '295).

Still regarding claims 19-20, Yoshihiro et al. (JP '295) do not specify wherein the amount of copper and molybdenum present would be an amount effective to form a sulfide layer on a formed chromium oxide layer.

Kushida et al. ('821) disclose a substantially similar martensitic stainless steel (col. 5, see weld metal) requiring at least 0.5 mass percent of each of molybdenum and copper to provide sour gas resistance when being exposed to a hydrogen sulfide containing fluid (col. 10, lines 38-63). This resistance (layer) would inherently be formed at the surface of the martensitic stainless steel because the surface would be the main point of contact with the fluid.

Yoshihiro et al. (JP '295) disclose a martensitic stainless steel wherein the copper and molybdenum content would be 0.1-0.6 mass percent (overlapping the requirement of Kushida et al. ('821) at 0.5-0.6 mass percent). Therefore, it would be obvious to one of ordinary skill that the martensitic stainless steel of Yoshihiro et al. (JP '295) would have the effective amounts of copper and molybdenum to form a sulfide layer on a formed chromium oxide layer as a result of exposure to a sulfur containing environment.

Claims 3-8 and 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schumacher (US 5,089,067) with evidence from the ASM Handbook Volume 4 and Kushida et al. (US 6,379,821).

In regards to claims 3-8 and 13-20, Schumacher ('067) disclose a martensitic stainless steel alloy (abstract) as shown in the following table.

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP '295) (weight percent)	Overlapping range
abstract			
C	0.01-0.10	0-0.08	0.01-0.08
Si	0.05-1.0	0-1.0	0.05-1.0
Mn	0.05-1.5	1-4	1-1.5
P	0-0.03	0-0.03	0-0.03

Element	From Instant Claims (mass percent)	Yoshihiro et al. (JP. '295) (weight percent)	Overlapping range
S	0-0.01	0-0.01	0-0.01
Cr	9-15	13-17	13-15
Ni	0.1-4.5	0-1	0.1-1
Al	0-0.05	Not indicated	0
N	0-0.1	0-0.12	0-0.1
Cu	0.05-5	1.5-4	1.5-4
Mo	0.05-5	0-1	0.05-1
B	0.0002-0.005 (claims 5-8 and 17-20)	0-0.005	0.0002-0.005
Ti	0.005-0.5 (claims 15-20)	0-0.5	0.005-0.05
V	0.005-0.5 (claims 15-20)	0-0.5	0.005-0.5
Nb	0.005-0.5 (claims 15-20)	0-0.5	0.005-0.1
Fe	balance	balance	balance

The Examiner notes that the disclosed amounts of carbon, silicon, manganese, phosphorus, sulfur, chromium, nickel, aluminum, nitrogen, copper, molybdenum, boron titanium, vanadium, and niobium of the martensitic stainless steel alloy disclosed by Schumacher ('067) overlaps with the composition of the claimed invention. Therefore, a prima facie case of obviousness exists. See MPEP 2144.05 I. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select the claimed composition over the disclosed composition of Schumacher ('067) because Schumacher ('067) teaches the same utility (martensitic stainless steel alloy) throughout the disclosed ranges.

In regards to the claimed formulas of $0.2\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 3) and $0.55\% \leq \text{Mo} + \text{Cu}/4 \leq 5$ (claim 4), the Examiner asserts that the martensitic stainless steel of Schumacher ('067) clearly envisions compositions satisfying this formula because Schumacher ('067) clearly envisions compositions having molybdenum compositions up to 1 weight percent and copper compositions from 1.5 to 4 weight

percent.

In regards to the claim limitation of having hardness that is 30-45 HRC, Schumacher ('067) discloses that a wide range of hardness value from (HR)B 95 to (HR)C 40 or higher can be attained (col. 4, lines 56-69).

In regards to the claim limitation of having not more than 0.5 volume percent carbides in the grain boundaries, The ASM Handbook Volume 4 discloses that high carbide formation results from high temperature tempering (pg. 124, cols. 1-2). Schumacher ('067) do not specify wherein the martensitic stainless steel would have carbides in the grain boundaries of the prior austenite in a proportion of not more than 0.5 volume percent, but Schumacher ('067) does specify that the alloy avoids the presence of excessive carbides which lower corrosion resistance and heat treatment in the range of 930-1095°C followed by air or oil quench which would be substantially similar to that of the current invention (col. 1, lines 14-28). Tempering may be performed to achieve a desired level of strength. Therefore, the property of having not more than 0.5 volume percent carbides in the grain boundaries would be expected. See MPEP 2112.01 I.

Still regarding claims 13-20, Schumacher ('067) do not specify wherein the amount of copper and molybdenum present would be an amount effective to form a sulfide layer on a formed chromium oxide layer.

Kushida et al. ('821) disclose a substantially similar martensitic stainless steel (col. 5, see weld metal) requiring at least 0.5 mass percent of each of molybdenum and copper to provide sour gas resistance when being exposed to a hydrogen sulfide

containing fluid (col. 10, lines 38-63). This resistance (layer) would inherently be formed at the surface of the martensitic stainless steel because the surface would be the main point of contact with the fluid.

Schumacher ('067) disclose a martensitic stainless steel wherein the copper content of 1.5-4 weight percent and molybdenum content of up to 1 weight percent (achieving the minimum requirements of Kushida et al. ('821)). Therefore, it would be obvious to one of ordinary skill that the martensitic stainless steel of Schumacher ('067) would have the effective amounts of copper and molybdenum to form a sulfide resistance (layer) on a formed chromium oxide layer as a result of exposure to a sulfur containing environment.

Response to Arguments

Applicant's arguments filed 13 December 2006 have been fully considered but they are not persuasive. The Examiner herein responds to the Applicant's arguments with respect to claims 1-2. New rejection grounds have been applied for claims 3-8.

First, the Applicant argues that Lena ('602) is drawn to a different structure because of different processing conditions. This Examiner believes that this contention is improper because the only structure limitation beyond the necessity of a martensitic stainless steel is that the amount of carbides in the grain boundaries of the prior austenite is not more than 0.5 volume percent and Lena ('602) satisfies this limitation by disclosing that the alloy would not have any metal carbide in the grain boundaries (col. 11, lines 43-48).

Second, the Applicant argues that hardness is a function of the composition and the treatment process. However, Lena ('602) discloses an overlapping composition and the hardness would be inherent of a martensitic steel with the same composition. See MPEP 2112.01.I. Furthermore, the Applicant has the burden to show that a martensitic stainless steel with this composition would not have the minimum hardness in addition to showing that the minimum hardness of a martensitic stainless steel with modifications of the composition within the overlapping ranges could not be achieved by the process disclosed by Lena ('602).

Conclusion


Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP §706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a). A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jessee Roe whose telephone number is (571) 272-5938. The examiner can normally be reached on Monday-Friday 7:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JR


ROY KING
EXAMINER
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